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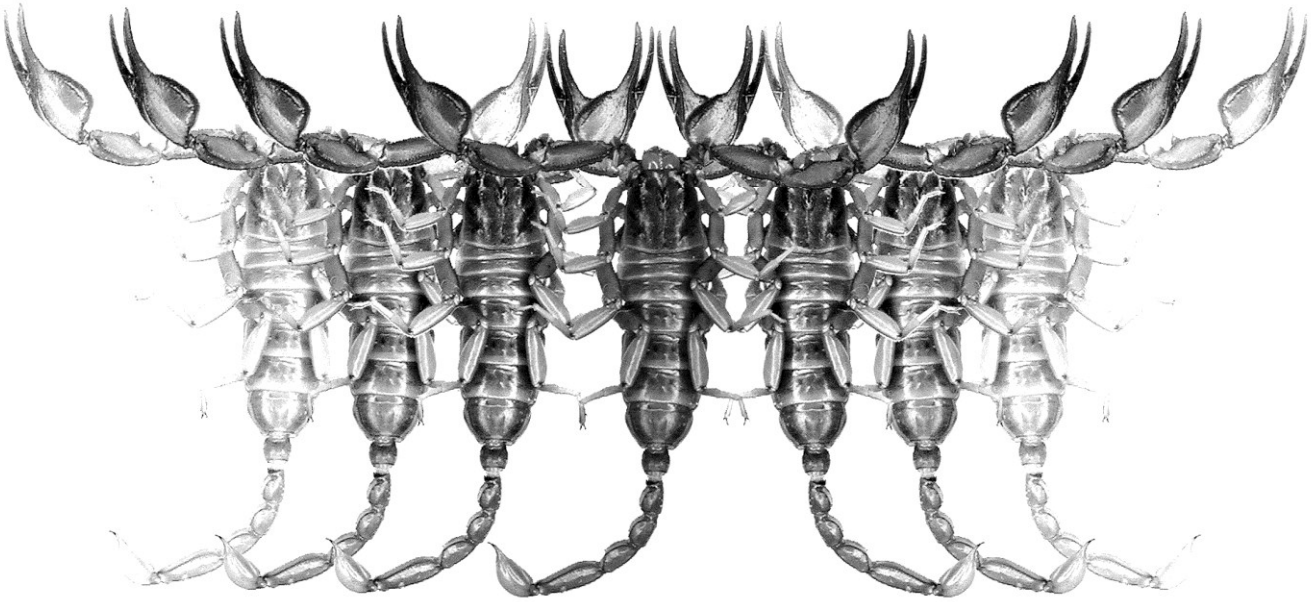

A New Species of *Buthus* Leach, 1815 from Libya (Scorpiones: Buthidae)

Andrea Rossi, Gioele Tropea & Ersen Aydın Yağmur

October 2013 — No. 167

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Euscorpius — Occasional Publications in Scorpiology. 2013, No. 167

A new species of *Buthus* Leach, 1815 from Libya (Scorpiones: Buthidae)

Andrea Rossi [1, 4], Gioele Tropea [2] & Ersen Aydın Yağmur [3]

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Summary

Although Libya covers a very wide territory in northern Africa, only two species of the genus *Buthus* have been recorded from this country: *B. tunetanus* (Herbst, 1800) and *B. barcaeus* Birula, 1909. In the present study, a third species, *Buthus lourencoi* **sp. n.**, closely related to *Buthus egyptiensis* Lourenço et Cloudsley-Thompson 2012, is described from west Libya, around the area of Tripoli. An identification key for the scorpions of the genus *Buthus* (Leach, 1815) that occur in Algeria, Tunisia, Libya, and Egypt is provided.

Introduction

Traditionally (Vachon, 1952), only five species of the genus *Buthus* were accepted: *B. atlantis* Pocock, 1889, *B. barbouri* Werner, 1932, *B. insolitus* Borelli, 1925, *B. maroccanus* Birula, 1903, and *B. occitanus* (Amoreux, 1789). Vachon (1952) noted the presence of many subspecies and "varieties" within the genus *Buthus* but the number and the status of the species remained unchanged for decades until Lourenço and co-workers started to describe several new species and to raise subspecies to species level, from Africa (Lourenço, 2002, 2003, 2005a, 2005b, 2005c; Lourenço & Slimani, 2004; Lourenço & Qi, 2006; Lourenço & Cloudsey-Thompson, 2012; Lourenço & Simon, 2012; Lourenço & Leguin, 2012; Lourenço et al., 2009, 2010, 2012), Asia (Lourenço, 2008; Lourenço et al., 2010), and Europe (Lourenço & Vachon, 2004; Lourenço & Rossi, 2013). According to this new approach, other authors also contributed to the knowledge of the species within the genus *Buthus*: Kovařík (2006, 2011), Yağmur et al. (2011), Touloun & Boumezzough (2011), and Rossi (2012, 2013).

The validity of three species is currently questionable: *Buthus barbouri* Werner, 1932; *B. insolitus* Borelli, 1925; and *B. intermedius* (Ehrenberg, 1829). The type of *B. barbouri* Werner, 1932 is lost and no other specimens are known. According to Vachon (1952), the description is not clear and it could be a synonym of *B. maroccanus* Birula, 1903 or even *Androctonus mauritanicus* (Pocock, 1902). Regarding *B. insolitus* Borelli, 1925, Kovařík (2003) considered it as a *nomen dubium* since its holotype is lost and it is difficult to understand the taxonomic position of this species from the description. Kovařík (2006) raised to species status *Androctonus (Leiurus) tunetanus intumescens* (Ehrenberg, 1829), and moved it to the genus *Buthus.* In the same work, he synonymized *Androctonus (Leiurus) tunetanus intermedius* (Ehrenberg, 1829) from Lohaie in Yemen with *B. intumescens*. Braunwalder & Fet (1998), Fet & Lowe (2000), and subsequently Kovařík (2006) considered the type locality of *B. intermedius* probably erroneous since no other *Buthus* were reported from the Arabian Peninsula. However, Lourenço (2008) doubted the conclusions of Kovařík due to the poor condition of the type material and formally regarded *Buthus intermedius* as a valid species, considering also the type locality as trustable since he reported a second specimen belonging to the genus *Buthus* in the Arabian Peninsula and described it as a new species.

In the present work, *Buthus lourencoi* **sp. n.** is compared with the species of the genus *Buthus* that occur in Algeria, Tunisia, Libya and Egypt including *B. intumescens* and *B. israelis*, both considered as valid and different species. The status of *B. israelis* was not totally clear (Kovařík, 2006; Lourenço et al., 2010; Yağmur et al., 2011) until the recent synopsis of the Egyptian *Buthus* (Rossi, 2013) brought attention to different

Figure 1: metasomal segments I and II of *Buthus intumescens* (Ehrenberg, 1829), female holotype (ZMBH), showing elongated segments (longer than wide). Photo courtesy by Dr. Jason Dunlop and Mrs. Anja Friederichs (ZMBH).

length/width ratios of the first metasomal segment in *B. intumescens* and *B. israelis*. According to Levy & Amitai (1980), all specimens of *B. israelis* have, at least, the first metasomal segment always wider than long (in females, usually also the second metasomal segment is wider than long). However, in the female holotype of *B. intumesecens*, all metasomal segments are clearly longer than wide (Fig. 1).

An identification key of the species of the genus *Buthus* that occur in Algeria, Tunisia, Libya and Egypt (including the Asian part of Egypt equivalent to the Sinai Peninsula) are given. In some cases, both sexes of a species are necessary for a correct identification.

Among the species found in those territories, *B. barcaeus* (Birula, 1909) needs a redescription because the old description in German is rather obsolete, and some characters are not totally clear.

Material and methods

Digital images were edited with Gimp 2.6 and Adobe Photoshop. Morphology and measurements (in mm) mostly follow Hjelle (1990) and Sissom et al. (1990), respectively. The measurement of metasomal segment width is as illustrated in Vachon (1952).

Abbreviations

ARPC, Private collection of Andrea Rossi, Massa, Italy;
MCVR, Museo Civico di Storia Naturale di Verona, Verona, Italy;
MHNG, Muséum d'Histoire Naturelle de Genève, Geneva, Switzerland;
MRSN, Museo Regionale di Scienze Naturali di Torino, Turin, Italy;
MSNB, Museo Civico di Scienze Naturali di Bergamo "E. Caffi", Bergamo, Italy;
MZUF, Museo di Storia naturale dell'Università di Firenze, sezione di Zoologia "La Specola", Florence, Italy.
ZMBH, Museum für Naturkunde der Humboldt-Universität Berlin, Berlin, Germany.

Systematics

Family Buthidae Koch, 1837
Genus *Buthus* Leach, 1815

Buthus lourencoi Rossi, Tropea et Yağmur, **sp. n.**

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Buthus occitanus: Kovařík & Whitman, 2005: 106.

Type material: 1 adult ♀ holotype, Mellaha (Tripoli), Libya (32°53'N, 13°17'E), February-March 1935, leg. W. Benzi (MZUF n. 783). **Note:** the specimen was misidentified by Di Caporiacco as *Buthus occitanus tunetanus,* as indicated by a label in the vial (Fig. 2).

Etymology: the species is named in honor of Prof. Wilson Roberto Lourenço, Paris, France, for his impres-

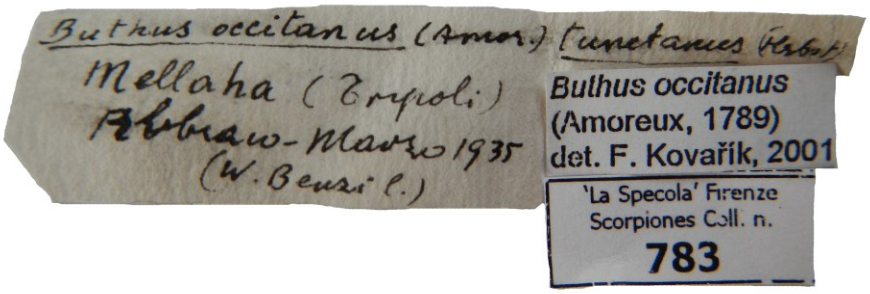


Figure 2: Labels of *Buthus lourencoi* **sp. n.** female holotype (MZUF).

sive contributions to the knowledge and taxonomy of the genus *Buthus*.

Diagnosis: Species of large size for the genus, exceeding 80 mm in total length. General coloration yellow with tergites darker (yellowish-brown) and pedipalps yellowish -orange (Fig. 3 and 4). Carinae rather marked on carapace and moderately marked on tergites and metasomal segments. Movable and fixed fingers with 11 rows of granules. Pectines with 30/30 teeth.

Description: based on female holotype. Measurements are given in Table 1.

Coloration: carapace basically yellowish with only intraocular area darker; tergites dark yellow to brownish with carinae black; metasoma and legs uniformly yellow; sternites pale yellow; pedipalps yellowish to orange. Pectines and genital operculum very light yellow.

Prosoma: carapace with marked anterior median carinae; central lateral and posterior carinae moderately marked, forming the typical lyre carinae configuration of the genus *Buthus*. Median eyes dark orange and three pairs of small lateral eyes black. Carinae dark orange.

Mesosoma: tergites I to VI with three longitudinal moderate carinae with dark pigmentation. Only tergite VII with five carinae. Tergites without longitudinal stripes of dark color but with a transversal wide stripe which is darker than the basic yellow. Sternites smooth except for sternite VII which bears four carinae. Other sternites show two vestigial furrows. Spiracles elongated.

Metasoma: very elongated with all segments longer than their wide (Fig. 5); length/width ratio of V metasomal segment about 2.2; segment I with 10 complete carinae; segments II and III with 10 carinae but lateral carinae incomplete and ventral carinae moderately marked with 2 and 4 bigger distal granules respectively; segment IV with eight carinae; segment V with five carinae, with tubercles of latero-ventral carinae marked. The intercarinal spaces are finely granulated. Anus with three lateral lobes (Fig. 6). Telson almost smooth with few setae; vesicle and base of aculeus yellowish but end of aculeus black; aculeus curved and very long; subaculear tubercle not noticeable.

Chelicerae: yellow, not reticulated, with black denticles; typical dentition of family Buthidae, as defined by Vachon (1963).

Pedipalps: femur pentacarinate with marked carinae; patella with eight moderate carinae; all carinae without dark pigmentation. Dorsal trichobothria of femur arranged in β-configuration (Fig. 7). Chela smooth, without carinae (Fig. 8). Movable fingers with 11 oblique rows of granules with one internal and one external granule and three distal granules (Fig. 9); fixed finger with 11 oblique rows of granules. Chela relatively narrow with length/width ratio of 4.35.

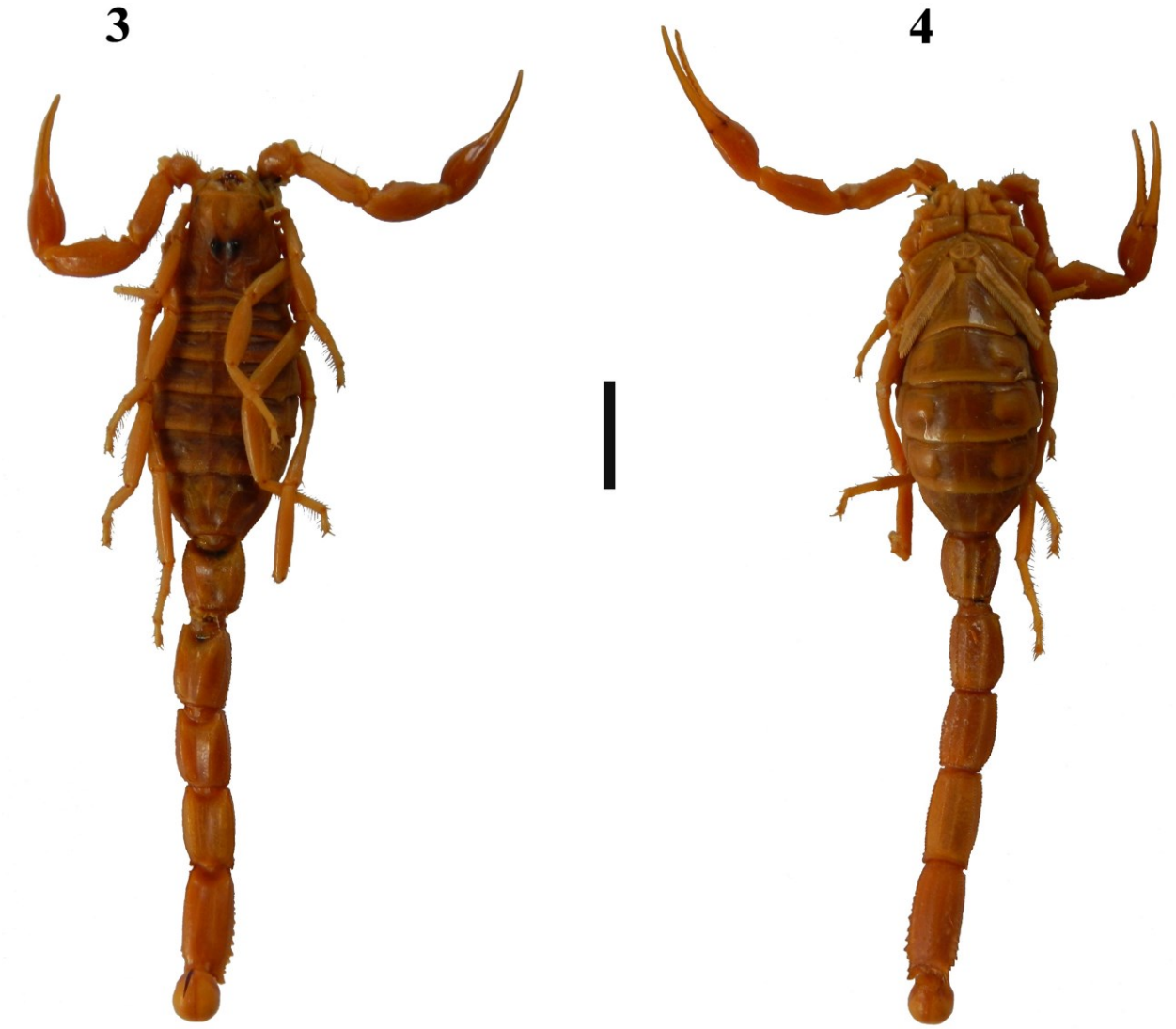
Chaetotaxy: polytrichous, as defined by Vachon (1952).

Legs: coxa, femur and patella with moderate carinae and sparsely hirsute; tarsus with two ventral longitudinal rows of setae. Tibial spurs present on legs III and IV.

Pectines, genital operculum and sternum: pectinal teeth count is 30-30. Genital operculum wide and lobate, split in two parts. Sternum triangular, longer than wide (Fig. 10).

Other material examined

Buthus adrianae Rossi, 2013: **Egypt**: El-Hamam, about 70 km SW of Alexandria, 1 ♂ holotype (MSNB), 1 ♂ paratype, 1 ♀ paratype (ARPC), March 2009. *Buthus barcaeus* Birula, 1909: **Libya:** 2 ♂♂, 3 ♀♀, Cyrenaica, 1909 (MRSN). *Buthus chambiensis* Kovařík, 2006: **Tunisia**: 1 ♂ (MCVR). *Buthus intumescens* (Ehrenberg, 1829): **Egypt**: 1 ♀ holotype (ZMBH) (based on digital photos). *Buthus israelis* (Shulov et Amitai, 1959): **Israel**: northern Israel, 1 ♂ (ARPC). *Buthus occitanus* (Amoreux, 1789): **France**: 2 ♂♂, 1♀, Uzés (Gard), 10–15 February 2005 (ARPC); 1 ♀, France: Uzés (Gard), 20–25 February 2009 (ARPC). *Buthus paris* (C. L. Koch, 1839): **Algeria**:1 ♀, Jurdjura, 1400 m a.s.l., leg. Sanna & Magnani, 2 June 1980 (MCVR); **Morocco**: 1 ♀, 2 ♀im., Taza (MCVR); 1 ♀, Ifrane, Atlante, 1200 m a.s.l., leg. Osella, 27 April 1986 (MCVR); 1 ♀, Moyen Atlas, 1600 m a.s.l., leg. Sanna & Magnani, 5 June 1985 (MCVR); **Tunisia**: 1 ♀, 2 im., Le Kef, 2 April 1976 (MZUF); 1 ♀ Ouadi Magrat 16 May 1983 (MZUF); 1 ♂ (ARPC). *Buthus tassili* Lourenço, 2002: **Algeria**: 1 ♂, Tassili, Tin Absteka, 1800 m a.s.l.,



Figures 3–4: *Buthus lourencoi* **sp. n.** female holotype (MZUF). **3.** Dorsal view. **4.** Ventral view.

leg. J. Garzoni, 8 January 1967 (MHNG); 1 ♀, Tassili, Djabaren, 1650 m a.s.l., leg. J. Garzoni, 8 January 1967 (MHNG). *Buthus tunetanus* (Herbst, 1800): **Tunisia**: 3 ♂♂, 1 ♀, 2 im., 1876 (MZUF); 2 ♀♀, Le Kef (MSNB); 2 ♀♀ im., Gafsa (MCVR).

For the distribution of the species of *Buthus* present in Algeria, Tunisia, Libya, and Egypt, see map (Fig. 11).

Comparisons

Buthus lourencoi **sp. n.** belongs to the *Buthus occitanus* species complex and it is closely related to *Buthus egyptiensis* Lourenço et Cloudsey-Thompson, 2012, recently described from Egypt. Both *B. egyptiensis* and *B. lourencoi* **sp. n.** are very large scorpions, with elongated metasomal segments and ventral carinae moderately marked on II and III metasomal segments. At the same time, *B. egyptiensis* can be distinguished by: 1) lower number of pectinal teeth, 27–26 in female instead of 30; 2) lower number of granule rows on movable finger of pedipalps, 10 instead of 11; 3) tergites with blackish longitudinal stripes absent in *B. lourencoi* **sp. n.**; 4) anus with two lateral lobes in *B. egyptiensis* while *B. lourencoi* **sp. n.** has three lateral lobes.

Buthus lourencoi **sp. n.** can be distinguished from the other two species of *Buthus* present in Libya (*B. tunetanus* and *B. barcaeus*) by a combination of characters: 1) females of both *B. barcaeus* and *B. tunetanus* have stocky metasomal segments with I segment never longer than wide but in *B. lourencoi* **sp. n.** the metasomal segment I is strongly elongated, very longer than wide; also males of *B. barcaeus* and *B. tunetanus* have stocky metasomal segments with I segment usually not longer than wide; 2) *B. barcaeus* and *B. tunetanus* have lower number of pectinal teeth, up to 29 in females of *B. barcaeus* (Rossi, unpublished data) and *B. tuneta-*

***Buthus lourencoi* sp. n.**, female holotype	
Carapace length	9.22
Carapace posterior width	10.04
Mesosoma length	21.51
Metasoma segment I length/width	6.60/5.82
Metasoma segment II length/width	7.44/5.47
Metasoma segment III length/width	7.72/5.33
Metasoma segment IV length/width	9.11/5.06
Metasoma segment V length/width	10.31/5.11
Telson length/width/heigth	9.52/4.34//4.07
Aculeus length	4.64
Chela length/width/heigth	14.52/3.35/3.72
Movable finger length	9.5
Patella length/width	8.79/3.36
Femur length/width	7.16/2.42
Total length	**81.43**
Pectinal teeth	30-30
Rows on movable and fixed fingers of pedipalps	11-11/11-11

Table 1: Measurements of *Buthus lourencoi* **sp. n.**, female holotype (mm).

nus (Lourenço, 2003; Kovařík, 2006), while female of *B. lourencoi* **sp. n.** has 30 pectinal teeth; 3) *B. barcaeus* and usually also *B. tunetanus* has very marked ventral carinae on the second and third metasomal segment but those carinae are less marked in *B. lourencoi* **sp. n.**; 4) *B. barcaeus* has 12 rows of granules on movable finger of pedipalps whereas *B. lourencoi* **sp. n.** has 11 rows; 5) metasomal segment IV of *B. barcaeus* is with intermediary (lateral median) carinae but *B. lourencoi* **sp. n.** lack of lateral median carinae on segment IV; 6) anus of both *B. barcaeus* and *B. tunetanus* has only two lateral lobes, but they are three in *B. lourencoi* **sp. n.**; 7) both *B. barcaeus* and *B. tunetanus* have dark tergites whereas in *B. lourencoi* **sp. n.** they are uniformly light (yellowish).

Recently, another new Egyptian species, *B. orientalis* from Alexandria, was described (Lourenço & Simon, 2012). This species can be distinguished from *B. lourencoi* **sp. n.** by: 1) smaller total size with females up to 62 mm in total length; 2) lower number of pectinal teeth (24–27 in females); 3) lower number of granule rows on the movable finger, only 10; 4) anus with two lateral lobes.

Another species, *B. paris* (C. L. Koch, 1839), which is widespread from Tunisia to Morocco, is easily distinguished by: 1) a lower number of pectinal teeth, up to 28 in females; 2) aculeus strongly shorter than vesicle; 3) the metasomal segment I wider than long in females; 4) lower length/width ratio of metasomal segment V, less than 2.0; 5) carapace and mesosoma dark; 6) anus with two lateral lobes.

Also other two species are present in Tunisia: *B. chambiensis* Kovařík, 2006 and *B. dunlopi* Kovařík, 2006, different in a combination of characters from *B. lourencoi* **sp. n.**; *B. dunlopi* is different in: 1) number of pectinal teeth (26–28 in females); 2) number of rows on the movable fingers of pedipalps ,which is 12; 3) chela length/width ratio (4.4–4.7); 4) length to width ratio of all metasomal segments; 5) very smaller size (up to 60 mm); 6) anus with two lateral lobes.

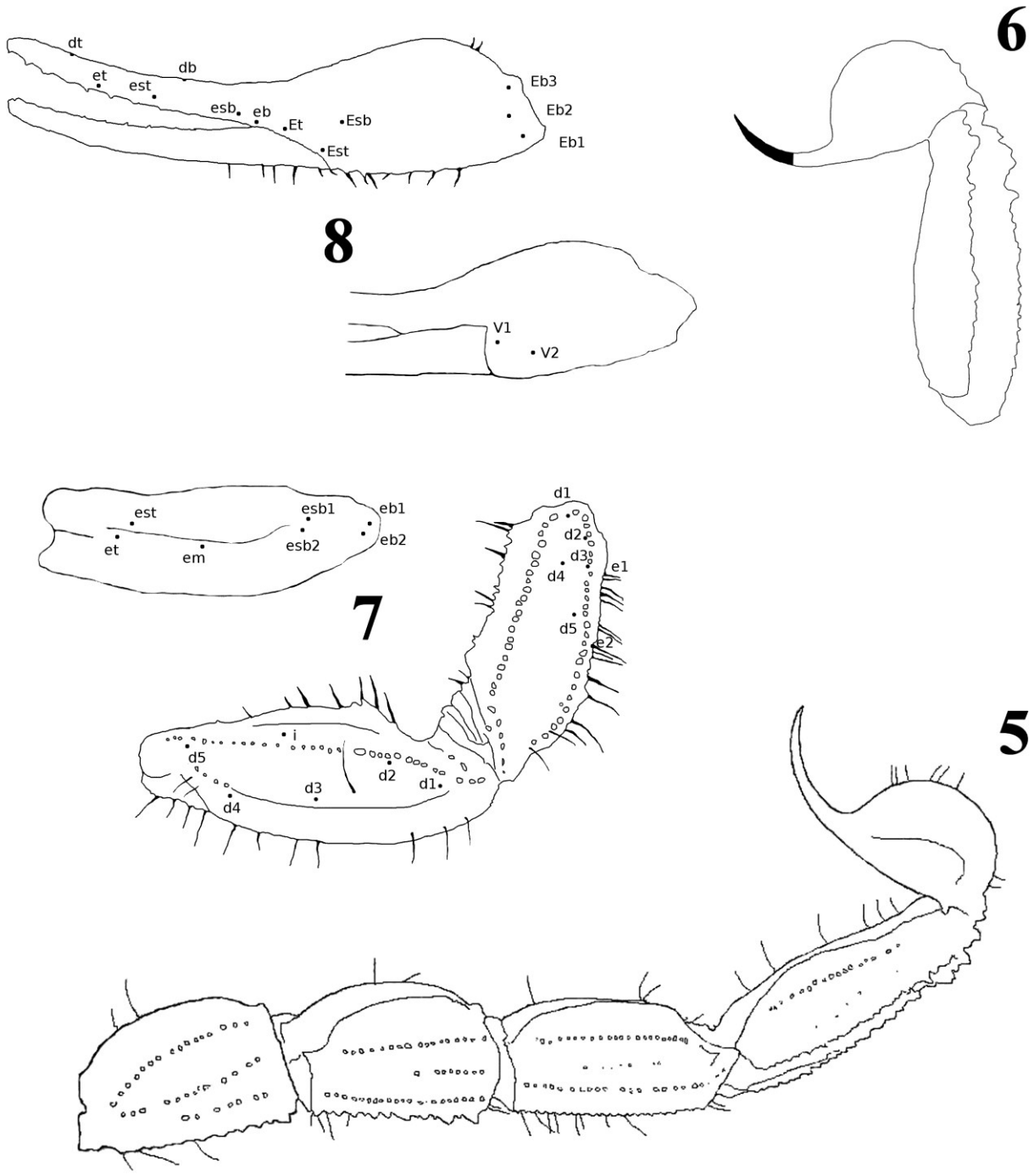
B. chambiensis is different in: 1) number of pectinal teeth (26–28); 2) chela length/width ratio (3.4 in females); 3) length to width ratio of all metasomal segments; 4) smaller size (60–70 mm); 4) anus with two lateral lobes.

B. tassili Lourenço, 2002 from Algeria is very different from *B. lourencoi* **sp. n.** and it can be distinguished by: 1) metasomal segment V and telson black; 2) lower number of pectinal teeth: 23-25 in females; 3) aculeus shorter; 4) smaller size (50–55 mm); 5) anus with two lateral lobes.

Very recently, Rossi (2013) described a new *Buthus* species from Lower Egypt. *Buthus adrianae* Rossi, 2013 is different from *B. lourencoi* **sp. n.** in: 1) size (female up to 68 mm); 2) color, with tergites very dark; 3) number of oblique rows of granules on the movable finger, only 10; 4) number of pectinal teeth, only 23–24; 5) anus with two lateral lobes.

From the northern Algeria, Lourenço (2013) reported a very small new species of *Buthus* that could be easily distinguished from *B. lourencoi* **sp. n.**, since *B. pusillus* Lourenço, 2013 has: 1) a very small total size (up to 41 mm); 2) ten complete carinae on metasomal segment II and III; 3) only two anal lobes; 4) weak setation, "oligotrichous" as defined by Vachon (1952).

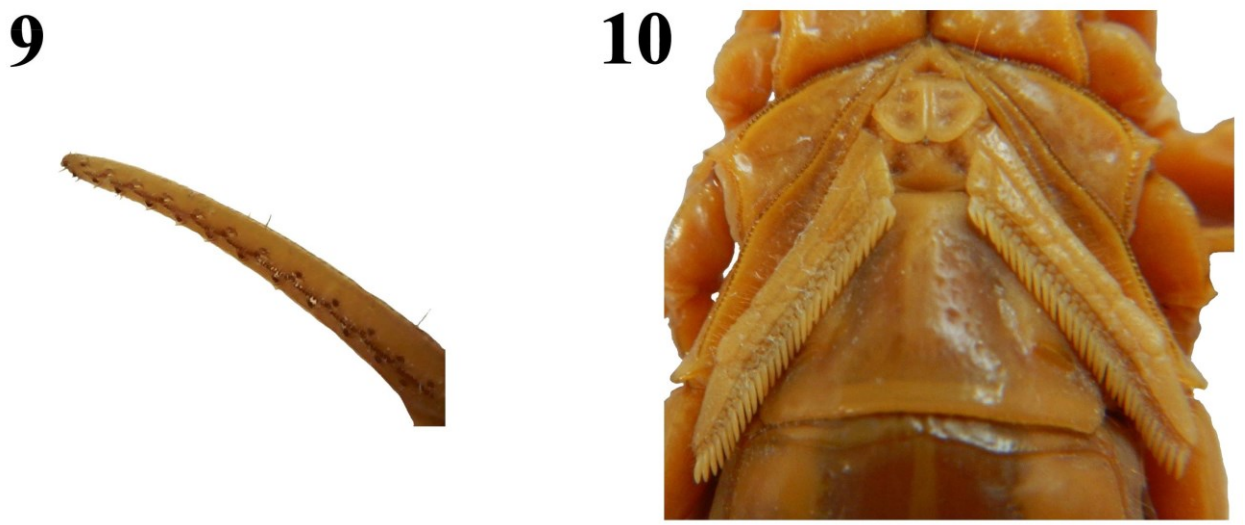
A special comment is necessary for *B. intumescens* and *B. israelis*. Apparently both species are reported



Figures 5–8: *Buthus lourencoi* **sp. n.** female holotype (MZUF). **5.** Lateral view of metasomal segments II, III, IV, V and telson. **6.** Lateral view of metasomal segment V and telson showing three anal lobes. **7.** Dorsal view of femur, and dorsal and external views of patella showing trichobothrial pattern. **8.** Dorsolateral and ventral views of chela showing trichobothrial pattern.

from Egypt. According to Fet & Lowe (2000) and Dr. J. Dunlop (pers. comm.) the type locality of *B. intumescens* is "Egypt" without more precise information. Instead, the localities in Egypt where *B. israelis* occurs are very well known thanks to the important work done by Levy & Amitai (1980). *B. israelis* in Egypt is reported only in Sinai Peninsula (Asian part of Egypt). *B. intumescens* could be distinguished from *B. lourencoi* **sp. n.** by: 1) ventral carinae strongly lobate on II and III metasomal segments; 2) smaller size (up to 65 mm); 3) lower number of pectinal teeth; 4) anus with two lateral lobes.

B. israelis could be distinguished from *B. lourencoi* **sp. n.** by: 1) the length/width ratio of all metasomal segments that is completely different; 2) the number of



Figures 9–10: *Buthus lourencoi* **sp. n.** female holotype (MZUF). **9.** Movable fingers of pedipalp chela showing 11 rows of granules. **10.** Pectines, genital operculum and sternum.

pectinal teeth is lower: 22–28 in females; 3) the smaller size (50–70 mm); 4) anus with two lateral lobes.

Key for the species of *Buthus* of Algeria, Tunisia, Libya and Egypt

1. Metasomal segment V and telson yellowish-orange . 2
- Metasomal segment V and telson blackish..... ….....*B. tassili* Lourenço, 2002

2. Eight carinae (and two incomplete carinae) on metasomal segments II and III..... 3
- Ten complete carinae on metasomal segments II and III ….....…….... *B. pusillus* Lourenço, 2013

3. Metasomal segment I in females wider than long 4
- Metasomal segment I in females longer than wide or as long as wide.....7

4. Metasomal segment IV with intermediate (lateral median) carinae.....*B. barcaeus* Birula, 1909
- Metasomal segment IV without intermediate (lateral median) carinae.....5

5. Chela of pedipalps in males wider (or as wide as) than in females.....*B. tunetanus* (Herbst, 1800)
- Chela of pedipalps in males narrower than in females.....6

6. Movable fingers of pedipalps with 12-14 rows of granules; size 60-80 mm; metasomal segment II in females always longer than wide; found in Africa (Morocco, Algeria, Tunisia).....*B. paris* (C. L. Koch, 1839)
- Movable fingers of pedipalps with 11-13 rows of granules; size 50-70 mm; metasomal segment II in females as long as wide or wider than long; found in Asia (Israel and Sinai Peninsula)..... .....*B. israelis* (Shulov et Amitai, 1959)

7. Small species, under 60 mm in total length .....*B. dunlopi* Kovařík, 2006
- Medium to large species (60-85 mm in total length)...8

8. Females with length/width ratio of metasomal segment V lower than 1.9 and chela length/width ratio equal to 3.4 ….....*B. chambiensis* Kovařík, 2006
- Females with length/width ratio of metasomal segment V equal or higher than 2.0 and chela length/ width ratio higher than 3.6.....9

9. Movable fingers of pedipalps with 10 oblique denticle rows.....10
- Movable fingers of pedipalps with 11 oblique denticle rows..... 12

10. Medium size (60-70 mm)..... 11
- Large size (85 mm; males unknown but could be a littlesmaller)..... ...*B. egyptiensis* Lourenço et Cloudsley-Thompson, 2012

11. Ventral carinae on metasomal segment II and III strongly lobate; vesicle strongly globular; aculeus shorter than vesicle; tergites pale yellow……. ……*B. orientalis* Lourenço et Simon, 2012
- Ventral carinae on metasomal segment II and III totally smooth; vesicle relatively small and flat; aculeus very long (almost as long as vesicle in males and longer

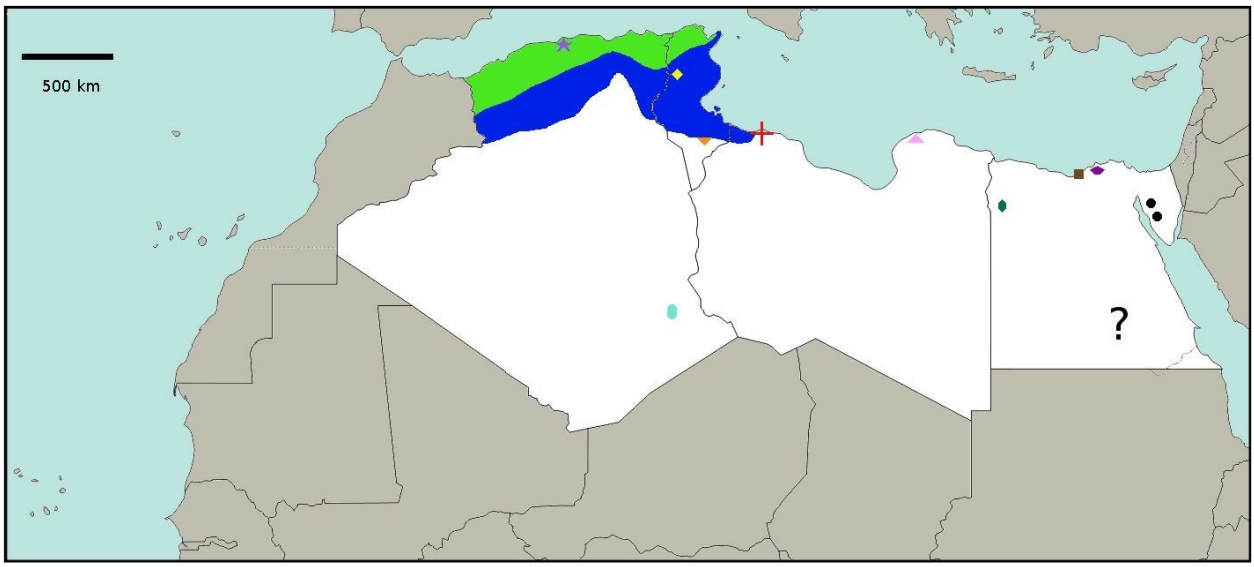


Figure 11: Map of the distribution of *Buthus* species in Algeria, Tunisia, Libya, and Egypt. Light green area, *B. paris*; blue area, *B. tunetanus*; yellow rhombus, *B. chambiensis*; overturned orange triangle, *B. dunlopi*; pale blue oval, *B. tassili*; violet star, *B. pusillus*; pink triangle, *B. barcaeus*; dark green hexagon, *B. egyptiensis*; brown square, *B. adrianae*; purple pentagon, *B. orientalis*; black circle, *B. israelis*; red cross, *B. lourencoi* **sp. n.**; question mark, possible locality of *B. intumescens*.

than vesicle in female); tergites very dark, with two lighter longitudinal stripes..... *B. adrianae* Rossi, 2013

12. Smaller size (up to 65 mm); ventral carinae on II and III metasomal segment strongly lobate..... .....*B. intumescens* (Ehrenberg, 1829)
- Large size (over 80 mm); ventral carinae on II and III metasomal segment not lobate..... *B. lourencoi* **sp. n.**

Discussion

The territory of Libya is about four times larger than that of Morocco (the country with the highest diversity within the genus *Buthus*), but presently only three species of the genus *Buthus* are reported in Libya, including *Buthus lourencoi* **sp. n.**, whereas the number of species is 14 in Morocco. The reason is that the high mountains ranges in Morocco have probable acted (and still act) as strong barriers to gene flow resulting in genetically distinct clusters found within the area (Habel et al., 2012). Although the territory of Libya is mainly flat and this could justify a relatively small number of *Buthus* species, it is possible that also other undescribed species or populations could exist in Libyan Sahara (especially Fezzan) from where no *Buthus* are recorded. Only in the map proposed by Vachon (1952) a possible presence of *Buthus* spp. in Fezzan was reported, near to the Algerian border. In fact, only the coastal regions of Libya seem to be sufficiently studied concerning the scorpion fauna.

The discovery of *B. elhennawyi* Lourenço, 2005 from Niger and also the recent description of *B. hassanini* Lourenço et al., 2012 from Chad, the countries bordering Libya from the south, show that speciens of the genus *Buthus* could be present also in the deep Sahara, in the southern Libya.

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